IPSC

EQUIPMENT BID AND RECORD

USE 24HR TIME FORMAT

Requested by Aaron Nissen Div. IPSC Sec. IGS Submitted by _____ (Operator) _____ (Time) _____ (Date)

☐ Out of Service
☐ Clearance TO Aaron Nissen/ Garry Christensen (Responsible Party) Div. IPSC Sec. IGS
☒ O.K.

EQUIPMENT REQUESTED: Unit 2 Boiler Overfire Air Tests,, at 950 MW gross- 4 days, MStm Temp 1005 F/ HRH 1005 F/ throttled conditions.

NATURE OF WORK: Burner (new- ABTs) tuning and setup required for future State of Utah Required Testing for the Overfire Air System

BID Time
FROM: Tuesday (Time) 06:30- 18:00 MDST (Time) 04/27/04 (Date) **TO:** Friday (Time) 06:30- 18:00 MDST (Time) 04/30/04 (Date)

WORK Time
FROM: Tuesday (Time) 07:00- 17:30 MDST (Time) 04/27/04 (Date) **TO:** Friday (Time) 07:00- 17:30 MDST (Time) 04/30/04 (Date)

MST=Mountain Standard MDST=Mountain Daylight PST=Pacific Standard PDST=Pacific Daylight

PREPARATION REQUIRED: Throttle Press& valve position as needed for load / Main Steam Temp 1005F/ Hot Reheat 1005 F, 7 pulverizer operation (pulv-will specify which o/s). Boiler (in local), control reheat temps with bias dampers parked (no reheat sprays), no sootblowing during each test period, minimize convection pass sootblowing prior to each test (previous shift) so able to achieve Mstm & HRH temps at 950 MW, main steam temperature control by sprays is ok (but best to minimize, no prim sprays if possible)), no boiler drum blowdown during the test. Remove pulverizer- coal and prim air biases. Isolate Unit 1 CRH to aux steam supply.

BID APPROVED:

OPS Supv. _____ (Time) _____ (Date) Removed by _____ (Time) _____ (Date)

Supt. _____ (Time) _____ (Date) Issued to _____ (Time) _____ (Date)

Dispatcher _____ (Time) _____ (Date) Returned by _____ (Time) _____ (Date)

EQUIPMENT NORMAL: _____ (Time) _____ (Date) By _____ (Operator) _____ (Supv.)

Remarks: _____

5CC problem w/BID on Tues/Wed DO NOT TOUCH (LA Heat Wave)

Load Racking going to 950 4/26/04 @ midnight

IGS Unit 2 Boiler, Burner, Overfire Air System and SH Platen Extension POST- OUTAGE Testing

TEST #	DATE & TIME	LOAD MWg	TEST CONDITIONS	OFA%	OFA Dampers	O2%	NOx	CO
Requirements:								
State of Utah Required Testing (to demostrate no increase in CO due to installation of Overfire Air System)								
OFA Diagnostics Testing (to determine best spot to operate and develop control curves)								
WEEK 2								
Day 1	04/26/2004 Mon 6:30- 18:00	**900**	all 8 Pulv I/S	0%	inlet dampers closed inner air flow adjustments outer air flow balance	3.0	< 0.37	< 100 ppm
Rotate all pulv O/S to establish economizer backpass profiles								
Day 2	04/27/2004 Tues 6:30- 18:00	**950**	initially- all 8 Pulv I/S see- Operation Test Setup	0%	inlet dampers closed	3.0	< 0.37	< 100 ppm
Day 3	04/28/2004 Tues 6:30- 18:00	**950**	Sequence each pulv O/S to establish economizer backpass profiles					
Day 4	04/29/2004 Tues 6:30- 18:00	**950**	cont- Sequence each pulv O/S to establish economizer backpass profiles					
Day 5	04/30/2004 Tues 6:30- 18:00	**950**	cont- Sequence each pulv O/S to establish economizer backpass profiles					

NOTE: O2% based on Boiler Outlet Grid values

Boiler Test Plan for Over Fire Air System and SH Platen Extension

4/26/04 r1

IGS Unit 2 POST-Outage Testing

Testing Objectives- There are a series of Boiler Tests which are being requested following the modifications which have been made to the Unit 2 boiler. The Unit 2 Major Outage (4 week) modifications consisted of installing new burners (ABT), new overfire air system (BPI) and extending the superheater platen section. The objective of the POST-outage testing is as follows:

Burner Setup and Tuning- to determine optimum operating positions of the outer air hoods (controls total air flow), outer air spin vane and inner air hood. We are trying to determine the operational "sweet spot" to achieve optimum NOX (target < 0.37 #/mbtu w/o OFA) and CO (target < 100 ppm w/o OFA). Additionally, we are balancing combustion air flow to each individual burner using the outer hoods and IBAMS (individual air flow instrumentation). After initial burner setting are established will go thru all combinations of 8 pulverizers out of service to reduce high concentrations of CO (bad actor burners).

Overfire Air Setup and Tuning- to determine operational "sweet spot" with the overfire air system in service (optimum NOX (target < 0.33 #/mbtu w/o OFA) and CO (target < 180 ppm w/o OFA). We are balancing (by throttling) overfire air flow at each of the four corners (monitoring CAMS flow measurement) and then testing 1/3, 2/3 and both 1/3 & 2/3 dampers to determine best operating conditions. After initial OFA setting are established will go thru all combinations of 8 pulverizers out of service to reduce high concentrations of CO.

State of Utah- Required Testing- document operating conditions after the Overfire Air System has been installed. POST-outage testing is being conducted on the request from the Utah Division of Air Quality based on concerns with an increase in CO emission levels, operating with the overfire air system. The Boiler Testing will be at a Load of 950 MWgross, Westridge coal blend, O2% and Overfire Air% varies (see Boiler Test Conditions and Operational Test Setup).

Test Personal: The testing is being conducted by IPSC Engineering who is leasing test quality gas analyzers from Power Generation Technologies (PGT).

Test Coordinators- Aaron Nissen and Garry Christensen
Gas Analyzers and Test Grid- Garry Christensen, Dave Spence & Rob Jeffery
Coal & Fly Ash sample collection- Dave Spence and Bill Tanner
Fly ash sample collection- Dave Spence, ISG Rod Hansen, Rick Fowles/ Kurt Aldredge
possibly Babcock Power (BPI)- Steven Cox and Advanced Burner Tech (ABT)- Tarkle Larsen

Test Method- Testing will utilize the PI data acquisition system to document test conditions. In addition, a test grid is setup at the boiler outlet (11th floor) using 14 test probes at four different depths for a total of 56 points. The gas sampling system is setup with both east and west side averaging systems consisting of bubblers, vacuum pumps, chillers and desiccant filters. The cooled, dry, filtered gas samples are then analyzed for O2, CO2, and CO. Thermocouples are also at each location to get averaged boiler gas outlet temperatures. There is another test station at the stack mid-level for CO and O2 test measurements. It also includes test probe, sampling system, chillers and analyzers and data acquisition system.

NOTE, we will utilize the O2 measurement at the boiler outlet. We are seeing a bias between station O2 and the O2 at the boiler outlet grid. The O2% at the boiler outlet, however, agrees with higher Air Flow shown in CCS, correlates with the higher ID Fan rpm and amps, plus correlates with higher NOx and low CO levels.
As part of the testing, we will try to reconcile why we have high station O2 levels.

In addition to east and west side averaged gas conditions, individual test points will also be taken during a separate test to develop backpass test grid profiles. These profiles will include O2, CO, NOx and temperatures which will be used to troubleshoot and diagnosis burner setup and secondary air plus overfire air flow balancing.

OFA System 1/3 and 2/3 dampers plus OFA secondary air inlet dampers will need position checked during the course of the testing.

Fly ash samples will also be taken and correlated with the test results. We will need 2 Operators to help support fly ash sample collection. ISG will be collecting the fly ash samples at each of the different test points. All fly ash hopper rows need to be available (no maintenance work) and hoppers will need to be pulled down prior to the test (night shift) and between each test point.

Coal samples will also be taken throughout the test period at the coal feeder inlet (test taps installed special for testing). Note: there maybe a certain amount of coal spillage created while collecting these coal samples. Bottom ash samples will also be collected.

Boiler Performance Testing- Each test point needs 2 hours, allowing ½ to 1 hour between test points to lower O2, pull fly ash and sootblow for temperatures. Prior to each test period (daily), the gas analyzers need to be started, warmed up and calibrated. This process takes 1 to 1 ½ hours to complete. During this time, all tubing, bubblers, chillers, desiccant filters, and dust filters will be checked out.

Operational Test Setup- Boiler, Burner, & OFA Tests

NOTES:

1) PI system – needs to be up and running, no downtime or backups

2) CEM system – PI interface needs to be working

3) Do not washdown boiler in the backpass areas, due to test equipment, analyzers and computers.

4) Not for this phase ~~Coal Samples will also be taken at each test point at the coal feeder inlet (new test coal sample collection ports). Note: there may be a certain amount of coal spillage created while collecting these coal samples.~~

5) Not for this phase ~~Fly Ash Samples- need to be taken during each test period (need support of 2 Operators for fly ash sample collection). Fly Ash Hoppers need to be pulled down prior to the test (night shift) and between each test point. ISG will be collecting the fly ash samples at each test points. All fly ash hopper rows need to be available (no maintenance work)~~

Operational Test Setup- Boiler, Burner, & OFA Tests

Load (MWgross) 950
Controls– boiler to local (or manual), Boiler Test Objective is for stable boiler/ throttle pressure and let MWs float.
(throttling control valves okay- this is not a turbine test at valves wide open)
Overfire Air System to manual

Throttle Press & Control Valve Position as needed for load
Main Steam Temp (F) 1005
Main Steam spray (kpph) <200
Hot Reheat Temp (F) 1005
Reheat Sprays (kpph) 0
Bias Dampers (%) may have to take PRH side to manual & set between 30- 45%, to control RH temps

Sootblowing as required to achieve Main Stm, HRH and FEGT temps
No sootblowing (during each test period of 2 hrs), sootblowing is allowed between each test
NOTE: for 950 MWg operation, need to allow SH & RH areas to get dirtier, but blow waterwalls to achieve FEGT (furnace exit gas temp) and EGOT (economizer gas outlet temp)

FEGT target (F) 2200, controlled by waterwall sootblowing
EGOT target (F) 760

O2 levels (measured at boiler outlet with test equipment)
Not for this phase ~~VARIES from 3.5%, 3.0%, & 2.5% at 2 hour increments~~
~~Note: there is a discrepancy between station instrumentation and local test analyzers (local reads are higher by 0.5% to 1.0% O2)~~

Over Fire Air System local control
1/3 & 2/3 port dampers, VARIES from 0% OFA (baseline), both closed or inlet dampers closed
Not for this phase ~~6% (2/3 damper closed, 1/3 damper @open, balanced flow all 4 corners)~~
~~9%(2/3 damper open, 1/3 damper closed)~~
~~12% (2/3 damper open, 1/3 damper open)~~

OFA inlet dampers south (SW & SE) dampers throttled ~45% to get balanced N to S flows

NOx level target (#/mbtu) < 0.37
CO (ppm) < 100
Primary Air Duct Press ("wc) 43

Pulverizer Configuration- 7 I/S, (Sec air damper- 20%)
Note- Remove all pulverizer biasing (unless absolutely necessary due to unmanageable coal dribble)

Need all normally running equipment in-service (7 Pulv, all FD, PA & ID fans, etc.). This ensures good uniform air and gas flow distribution.

No Boiler Blowdown during the testing period
Isolate Unit 1 CRH to aux steam supply and route all building heat (if in service) drains to Unit 2.

Coal Supply- Westridge coal blend
No Rocks, please